

Antibiotic use: room for improvement

A. Verbon

Department of Internal Medicine, Erasmus MC, Rotterdam, the Netherlands,
email: a.verbon@erasmusmc.nl

Nowadays, appropriate use of antibiotic drugs is not only one of the key issues for infectious diseases physicians in their daily practice but also for policy makers, and the Dutch Minister of Health has put antimicrobial resistance and antibiotic use high on the international agenda. It has long been known that antibiotic therapy and selection of antibiotic resistant micro-organisms are related.¹ The Netherlands and Scandinavian countries are known for their prudent use of antibiotics and low antimicrobial resistance,² but also in the Netherlands antibiotic resistant micro-organisms are on the rise.³ Therefore upon suggestion by the SWAB and endorsed by the Inspectorate of Health, antibiotic stewardship teams (called the A-teams) were installed in all Dutch hospitals in 2014. The question is, however, are we really using antibiotics that badly in the Dutch healthcare system? Total antibiotic use in the Netherlands is one of the lowest in Europe² and as shown in the point prevalence study of antibiotic use by Van Spreuwel *et al.*, in this issue of the Netherlands Journal of Medicine, more than 75% of all antibiotics are prescribed according to the guidelines.⁴ Although we seem to be doing well, results of this point prevalence study still identify areas for improvement. Since the study was done in a tertiary hospital, it is not clear whether the results can be extrapolated to other hospitals in the Netherlands.

First, the 75.7% adherence to the guidelines seems high in comparison with other studies that measured antibiotic use. A point prevalence study in an Australian tertiary hospital showed 47% inappropriate use of antibiotic drugs, and in a study in a large Dutch teaching hospital study 37% inappropriate drug use was reported.^{5,6} The high adherence to the guidelines in Nijmegen may be explained by differences in country and the time the study was performed. Another explanation may be that for 33% of patients an infectious diseases specialist was involved in the prescription of antibiotics and in at least 15% of the prescriptions the advice of the infectious diseases specialist was considered to be similar to adherence to the guidelines.⁴ Involvement of infectious diseases specialists has been shown to increase adherence to guidelines.^{4,7}

Therefore, the adherence percentage in Nijmegen may be higher than in other hospitals in the Netherlands, especially those hospitals without an infectious disease (ID) consultation service.

Antibiotic drug use in the Netherlands is high, in the PREZIES network it has been shown that 32% of all admitted patients receive antibiotic medication⁸ and in Nijmegen even 41% of the admitted patients used antibiotic drugs. Improving prescription of these often used medications is not only necessary to halt the increasing antimicrobial resistance, but also to reduce drug toxicity and costs. Areas of antimicrobial stewardship should also include dosing of antibiotics, especially in the presence of renal insufficiency or co-medication, duration of (intravenous) therapy and switch from intravenous to oral antibiotic therapy; these areas were not addressed.⁴ In Nijmegen, use of amoxicillin-clavulanic acid and having a respiratory tract infection were associated with less adherence to the guidelines. Other studies showed that bone/joint infections, creatinine level > 120 mmol/l, carbapenem, macrolide and fluoroquinolone use and being under the care of the rehabilitation team were risk factors.^{5,6} These last two studies used the method developed by Gyssens *et al.*^{5,9} to define inappropriate use of antibiotic therapy. The difference in results in identification of areas of improvement suggests that hospitals should at least confirm that the areas for improvement of antibiotic therapy reported above are problematic in their wards too.

Another area of concern is empirical therapy, since only 42 of the 230 prescribed antibiotic drugs (18%) were directed at a known pathogen.⁴ Empirical therapy may be too broad, resulting in more antibiotic resistance. On the other hand, up to 47% of empirical antibiotic therapy in the Netherlands was deemed to be inappropriate without ID consultation, decreasing to 25% when an infectious diseases specialist was in consultation before the start of therapy.⁹ Start of empirical therapy may be a difficult area to address without overloading infectious diseases specialists, but computer-assisted clinical decision support systems may be used for this purpose in the future.¹¹

Taken together, identifying areas for improvement of antibiotic use is important for antibiotic stewardship with the aim of reduction of the percentage of inappropriate empirical therapy, adverse drug events, costs and increasing narrowing down of antibiotic drugs. As shown by Van Spreuwel *et al.* point prevalence studies of antimicrobial use are feasible and give valuable information for the A-teams and may be a tool to measure their effectiveness. As with surveillance of antimicrobial resistance, evaluation of antibiotic use is a prerequisite for antibiotic stewardship.

REFERENCES

1. Mouton RP, Glerum JH, van Loenen AC. Relationship between antibiotic consumption and requery of antibiotic resistance of four pathogens—a seven year survey. *J Antimicrob Chemother.* 1976;2:9-19.
2. European Centre for Disease Prevention and Control (2010) European Centre for Disease Prevention and Control Surveillance Report. Antimicrobial surveillance in Europe 2009. Annual report of the European antimicrobial resistance surveillance network (EARS Net.) ECDC, Stockholm.
3. Dutch Foundation of the working party on antibiotic policy (SWAB). Nethmap 2013. Consumption of antimicrobial agents and antimicrobial resistance among medically important bacteria in the Netherlands. Nijmegen: SWAB 2013.
4. van Spreuwel P, Blok H, Langelaar M, Kulberg BJ, Mouton J, Natsch S. Identifying targets for quality improvement in hospital antibiotic prescribing. *Neth J Med.* 2015;73:161-8.
5. Ingram PR, Seet JM, Budgeon CA, Murray R. Point prevalence study of inappropriate antibiotic use at a tertiary Australian hospital. *Intern Med.* 2012;42:719-21.
6. Willemsen I, Groenhuijzen A, Bogaers D, Stuurman A, van Keulen P, Kluytmans J. Appropriateness of antimicrobial therapy measured by repeated prevalence studies. *Antimicrob Agents Chemother.* 2007;51:864-7.
7. Palmay I, Elligsen M, Walker SA. et al. Hospital-wide rollout of antimicrobial stewardship: a stepped-wedge randomized trial. *Clin Infect Dis.* 2014;59:867-74.
8. Prevention of hospital infections by surveillance (PREZIES). Reference data March 2008 until March 2012: prevalence survey theme assessment antibiotic use, <http://www.rivm.nl>.
9. Gyssens IC, van den Broek PJ, Kulberg BJ, Hekster Y, van der Meer JW. Optimizing antimicrobial therapy. A method for antimicrobial drug use evaluation. *J Antimicrob Chemother.* 1992;30:724-7.
10. Kerremans JJ, Verbrugh HA, Vos MC. Frequency of microbiologically correct antibiotic therapy increased by infectious disease consultations and microbiological results. *J Clin Microbiol.* 2012;50:2066-8.
11. Paul M, Andreassen S, Taconelli E, et al. Improving empirical antibiotic treatment using TREAT, a computerized decision support system: cluster randomized trial. *J Antimicrob Chemother.* 2006;58:1238-45.